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The outcome of a photoselective vaporization prostatectomy using a high-performance system to treat benign prostatic hyperplasia with acute urinary retention

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ABSTRACT

Objective: Photoselective vaporization of the prostate (PVP) is an easy-to-learn procedure which shows promise as an alternative to transurethral resection of the prostate (TURP) in treating acute urinary retention with benign prostatic hyperplasia (BPH). In this retrospective study, we evaluated the safety and efficacy of PVP in patients with urinary retention due to BPH.

Materials and Methods: In total, 48 male patients aged 60–87 (mean, 72) years were included in the study. Preoperative data, postoperative outcomes, and complications were recorded in patients with a history of urinary retention before surgery.

Results: The average prostate volume was 59.2 (range, 41.71–120.1) mL. The respective preoperative prostate-specific antigen (PSA) level was 10.4 ng/mL, and the operative time was 45 (range, 30–90) min. The total applied laser energy ranged 60–120 (mean, 90 ± 25) kJ. The maximal urinary flow rate after surgery 14 mL/s, and the postvoided residual urine volume was 132 mL. Recorded surgical complications were hematuria in 10.4% and transient urinary retention in 8.3%.

Conclusion: PVP can improve the uroflow and peak flow rate in patients with urinary retention due to BPH with minimal postoperative discomfort and a low rate of complications.

1. Introduction

Male bladder outlet obstruction, a clinical syndrome caused by enlargement of the prostate, can cause acute urinary retention. Although a variety of surgical procedures are used to treat benign prostate hyperplasia (BPH) in geriatric patients, each has associated risks and limitations, and better alternatives are still needed.[1–5] BPH is the most common cause of lower urinary tract syndromes (LUTS) in men older than 50 years. Transurethral resection of the prostate (TURP) is the gold standard for treating acute urinary retention due to BPH. While TURP remains a good effective treatment, 15–20% of patients develop a significant complication or mortality.[3] Although it is widely used, TURP is associated with morbidity including hyponatremia-induced TURP syndrome. Many new techniques have been introduced as alternatives to replace this endoscopic technique, but their comparative efficacies are not well established. Although various laser surgical therapies for BPH have been investigated, their associations with prolonged irritative symptoms or urinary retention have limited their acceptance by urologists.[1–6]

Photoselective vaporization of the prostate (PVP) is a promising technique for resection of the prostate gland, especially in patients with underlying diseases, such as heart disease and hypertension.[5–7] This prostatectomy technique, especially in patients with a large prostate gland,[6] is a safe procedure and provides a virtually bloodless operation with immediate improvement in voiding. The objective of this retrospective clinical study was to evaluate the efficacy and safety of PVP for bladder outlet obstruction in Foley-catheterized patients.

2. Materials and methods

This study was approved by the Institutional Review Board of Chang Gung Memorial Hospital for the Protection of Human Subjects and informed consent was obtained from each patient. In total, 48 male patients (aged 60–87, mean 72 years) who underwent PVP from April 2007 to January 2009 were included in this retrospective study. All patients suffered from urinary retention and

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required Foley catheterization. Two-thirds of the patients required first-time Foley catheterization; eight patients required two times, and eight patients required three times. In addition to a complete medical history, physical examination, serum chemistry, urinalysis, and urine culture, all patients underwent a standard urological examination, including prostate-specific antigen (PSA), transrectal ultrasound measurement of the prostate, and International Prostate Symptom Score (IPSS) without an urodynamic study. The following formula was used for the prostate volume assessment: width (mm) × height (mm) × craniocaudal (mm) × pi/6. The mean prostate volume was 59.2 (range, 41.71–120.1) mL. None of the patients had a history of prostate carcinoma. Patients with urethral stricture, neurogenic bladder, and residual urine of more than 600 mL, urinary incontinence, urinary tract infection, or compromised renal function were excluded from the study. Renal sonography was also performed to rule out any kidney anomalies.

Fourteen (29.2%) of the patients had no previous medical history. Eight (16.7%) patients were taking warfarin, and 16 (33.3%) were taking aspirin. Two (4.2%) patients were prescribed heparin for heart disease. Three (6.25%) patients had liver disease. Three (6.25%) patients had parkinsonism. Two (4.1%) patients had a previous history of TURP. All patients required Foley catheterization due to bladder outlet obstruction.

PVP was performed under videoendoscopic guidance in all patients. During the procedure, the high-performance system (HPS) with lithium tribirate at 120 W was delivered by a 6-Fr side-firing fiber through a 22-Fr continuous-flow cystoscope. Greenlight HPS photoselective vaporization was performed using sterile 0.9% normal saline irrigation under spinal anesthesia. All patients were treated with a broad-spectrum antibiotic before and after the procedure, and were managed on an inpatient basis.

The procedure began at the bladder-neck region at the 7 o'clock position and proceeded in a clockwise direction. The prostatic lobes on each side were readily vaporized to within the capsular fibers by sweeping the laser fiber on the tissue with an anterior-to-posterior movement. In patients with a large median lobe, complete or partial resection of this tissue by laser fiber was first performed in order to facilitate treatment of the lateral lobes. Apical tissue was treated with careful attention to the verumontanum and external sphincter. The mean duration of the procedure was 45 (range, 30–90) min. The total applied laser energy ranged 60–120 kJ, with a mean of 90 ± 25 kJ. The procedure was patiently carried out until an adequate TUR-like cavity was achieved. A three-way 22-Fr urethral catheter was inserted postoperatively and removed within 48 hours. Postoperative efficacy measures were the mean and percent change from the baseline IPSS. A quality of life score, Qmax, and postvoided residual urine volume (PVR) were also measured. Patients were evaluated at 3, 6, and 9 months postoperatively for changes in these measures, including IPSS, the peak flow rate, average flow rate, and voided volume. A statistical analysis was performed using Student's *t* test and Fisher's exact test to compare differences in variables before and after PVP.

3. Results

The average duration of the operation was 45 (range, 30–90) min. The maximum postoperative hospital stay was 3 days. The urethral catheter was removed in less than 48 hours in all cases, and the mean duration of catheterization was 15 ± 8 (range, 16–48) hours.

Underlying conditions in the 48 patients included parkinsonism in one, mitral valve prolapse in one, liver cirrhosis in one, and two with previous endoscopic resection of the prostate. All patients had acute urinary retention before surgical treatment (Table 1). Medications for treating urinary symptoms, such as a neurogenic bladder or overactive bladder, were discontinued 3 days before surgery in such patients and reinitiated 7–10 days after surgery.

Table 1
Baseline characteristics.

Age range (mean)	60–87 (72) years
American Society of Anesthesiologists score (no./%)	
1	0
2	14 (29.2%)
3	34 (70.8%)
4	0
Mean prostate volume (mL)	59.2 ± 22.7
Mean residual urine (cm^3)	396 (range, 340–455)
Prostate-specific antigen (ng/mL)	10.4 ± 2.7
International Prostate Symptom Score (mean)	20.5 ± 7.2
Bother score (mean)	4.1 ± 2.5
Urine retention (%)	100

Immediately after the procedure, 38 patients reported 1–5 days of mild dysuria for which they received no specific treatment. Delayed mild transient hematuria (7–10 days) was reported by five patients. Eleven patients reported urgency and hesitancy after the procedure lasting for 10–14 days. However, none of the patients had incontinence or newly developed impotence, or required surgery after the procedure. Four patients required Foley re-catheterization for transient urinary retention, which was possibly attributable to edema after removal of the urethral catheter. None of the patients had any significant blood loss or any fluid reabsorption. None of the patients developed urethral stricture after the procedure. Ten percent of the sexually active patients suffered retrograde ejaculation. No other significant complication was demonstrated. Throughout the relatively long follow-up duration of 1 year, all of the patients reported a good quality of life and great satisfaction with their urinary stream. No patient required a repeat PVP during the study period. Follow-up was available for all patients at 3, 6, and 9 months (Table 2). The voided volume, peak flow rate, and PVR significantly decreased. The IPSS steadily decreased during the follow-up period after 9 months ($p < 0.05$).

4. Discussion

As PVP with the GreenLight system was previously shown to have a favorable safety profile, this study examined the efficacy of this novel technique for treating patients with acute urinary retention. The results of the procedure depend on the amount of energy delivered, and operators learn to apply more energy in less time as their experience increases. Also, depending on the severity and type of comorbidities, some patients were not treated with optimum amounts of energy in order to reduce the intra-operative risks. Ruzat et al[3] reported that high-power KTP laser vaporization of the prostate was an ideal one-stage procedure for patients at high risk and for those receiving anticoagulant therapy. Bouchier-Hayes et al[8,9] demonstrated that PVP was as effective as TURP, producing equivalent improvements in flow rates and IPSS but with markedly reduced length of hospital stay, length of catheterization, and adverse events.

Table 2
Effect of photoselective vaporization of the prostate on International Prostate Symptom Score (IPSS), maximum flow (Qmax), voiding volume, and postvoided residual urine volume (PVR).

	Preoperative	3 months	6 months	9 months
IPSS	20.5 ± 6.0	15.6 ± 5.5	12.5 ± 5.3	10.5 ± 6.5
Qmax (mL/s)	nil	14.0 ± 7.5	20.1 ± 10.8	23.0 ± 15.9
Voiding volume (mL)	nil	120 ± 20	170 ± 18	220 ± 25
PVR (mL)	nil	132 ± 98	69 ± 87	35 ± 38
No. of patients	48	48	48	48

In the present study, almost all men with urinary retention benefited from PVP with improvements in both subjective and objective voiding parameters. PVP is quite useful in treating geriatric patients with bladder outlet obstruction secondary to BPH.[10,11] Sometimes, it is not easy to immediately evaluate the physical health of patients with BPH. The HPS may have a lower risk of treating such patients as soon as possible. No previous study evaluated the effect of PVP in treating patients with Foley catheterization due to BPH. The risk of mortality and morbidity will be increased by the standard TURP as there is not enough time to evaluate the etiology in patients with acute urinary retention. All of the selected geriatric patients in this study were at relatively high risk to receive surgical treatment. Almost all of the patients were catheter-free after PVP. Fundementally, safety is the main consideration in treating geriatric patients with bladder outlet obstruction and PVP might be emerging as a safer alternative to TURP.[12]

In conclusion, although PVP cannot entirely replace TURP, it provides geriatric patients with another treatment option that may reduce the rate of morbidity and mortality when a surgical procedure is required for urinary retention due to BPH.

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